EUROPEAN PATENT APPLICATION

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(54) **Multivoice broadcast search method and apparatus in NICAM broadcasting receiver.**

(57) Disclosed are a multivoice broadcast search method and apparatus thereof comprising a tuner and demodulator 10 for processing radio frequency signals received from an antenna ANT and outputting FM audio signal FMS and NICAM broadcasting signals, a NICAM decoder and D/A converter 12 for receiving the NICAM signals from the tuner and demodulator 10, decoding and D/A converting the NICAM signals, so as to output a PCM L-channel signal PL and a PCM R-channel signal PR, and simultaneously supplying broadcasting state recognition signals MC2 and CTL to a microcomputer 14, first to third switching means for selecting and outputting a predetermined signal among the FM audio signal FMS, the PCM L-channel signal PL and the PCM R-channel signal PR under the control of the microcomputer 14, thereby the user can be informed what languages in the present multivoice broadcast are broadcast.

The multivoice broadcast search method comprises the steps of checking if the present received broadcast is a multivoice broadcast or not, storing logic values of the present broadcasting state, searching each of language broadcasts of the multivoice broadcast by setting the control signals to predetermined values, holding them for a predetermined time and outputting each of the language broadcasts sequentially for a predetermined time, and returning to the stored original broadcasting state so as to output it.

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Background of the Invention

The present invention relates to a multivoice broadcast search method and the apparatus thereof, and particularly to a multivoice broadcast search method and the apparatus thereof adapted to a TV set or a VCR set in European countries adopting a NICAM(Near Instantaneously Contend Audio Multiplexer) broadcasting receiver.

At present, most of the broadcasting stations have the tendency that they put multivoice stereo broadcasting programs on the air so as to provide a better service to the viewers when they broadcast audio signals. Accordingly, the broadcasting stations add a pilot signal to an audio signal so as to inform the viewers that the present broadcast is, for example, a stereo one or a multivoice one, regardless of a broadcasting format in the multivoice stereo broadcasting system.

Conventionally, an audio signal processing portion in a general TV set or a VCR set is designed so as for a viewer to select any one of final audio outputs. The audio information in an audio left channel which is referred to as L-channel hereinafter and an audio right channel referred to as R-channel hereinafter are not greatly different from each other in case of the stereo music broadcast, but those audio information are different from each other in case of the multivoice broadcast. Thus, the viewer can not know by which kind of language the present broadcasting program is broadcast until he confirms the broadcasting language by selecting either the L-channel or the R-channel when the presently received broadcast is changed from the stereo one to the multivoice.

Especially, the NICAM broadcasting system adopted in England and the northern European countries can broadcast a multivoice broadcast and a stereo one at the same time. The viewer can also select an audio channel among the various audio channels because the NICAM broadcasting system can transmit the respective independent languages (up to three kinds of languages) through one transmitting channel in the course of the multivoice broadcast. For example, the trilingual broadcast can be performed through a normal FM audio channel, a PCM audio L-channel and a PCM audio R-channel in the NICAM multivoice broadcast. That is, in the normal FM audio channel the French language is transmitted, in the NICAM PCM L-channel the English language is transmitted and in the NICAM PCM R-channel the German language is transmitted. These transmissions can be broadcast simultaneously.

Therefore, when the multivoice broadcast is selected by the viewer, it is required to search that the present multivoice broadcast includes an English language, a German language, and a French language so as to select his desired language broadcast with ease.

SUMMARY OF THE INVENTION

It is therefore, an object of the present invention to provide a multivoice broadcast search method for informing a viewer of broadcasting languages in the course of the multivoice broadcast by outputting an audio signal of an L-channel and then the other audio signal of an R-channel, respectively for a predetermined time, and for selecting the viewer's desired language broadcast when the viewer receives the multivoice broadcast.

It is another object of the present invention to provide a multivoice broadcast search apparatus for outputting audio signals in sequence of broadcasting languages A,B and C for a predetermined time when three kinds of broadcasting languages A,B and C are received by a viewer at the same time and then selecting the viewer's desired language broadcast in a multivoice broadcast receiver.

To accomplish the above objects of the present invention, there is provided a multivoice broadcast search apparatus in a NICAM broadcasting receiver comprising: a tuner and demodulator connected to an antenna and for selecting a viewer's desired frequency signal among radio frequency signals received from the antenna in accordance with a tuning signal inputted at a tuning signal input terminal, outputting NICAM broadcasting signals and simultaneously demodulating FM modulated signals so as to output FM audio signals;

a NICAM decoder and D/A converter connected to one output terminal of the tuner and demodulator and for decoding the NICAM broadcasting signals outputted from the tuner and demodulator, converting the decoded digital signals into analog signals, outputting PCM L-channel signals and PCM R-channel signals and simultaneously outputting broadcasting state recognition signals;

first switching means having first input terminals at which the PCM L-channel signals outputted from the NICAM decoder and D/A converter are inputted, second input terminals at which the FM audio signals outputted from the tuner and demodulator are inputted and first output terminals changed and connected to the first or the second input terminals according to a first switching control signal and for selecting either the PCM L-channel signals and the PCM R-channel signals, or the FM audio signals;

2

second switching means having a third input terminals each connected to the first output terminals of the first switching means, and a second output terminal changed and connected to one of the third input terminals according to a second switching control signal and for selecting a single output;

third switching means having fourth input terminals each connected to the first output terminals of the first switching means, and a third output terminal changed and connected to one of the fourth input terminals according to a third switching control signal and for selecting a single output;

a microcomputer for supplying the first to third switching control signals to the first to third switching means according to the broadcasting state recognition signals supplied from the NICAM decoder and D/A converter, and outputting the tuning signal and the first to third switching control signals according to the viewer's selected signal at a key matrix circuit coupled to the micro-computer; and

output means connected to the second output terminal and the third output terminal respectively, and for outputting an audio L-channel signal and an audio R-channel signal respectively.

There is also provided a multivoice broadcast search method in a NICAM broadcasting receiver comprising the steps of : determining whether the present broadcast is a multivoice broadcast or not, so as to store the present broadcasting state when the present broadcast is the multivoice broadcast, and to end an operation when the present broadcast is not the multivoice broadcast;

searching each of language broadcasts of the multivoice broadcast by setting values of predetermined control signals to predetermined values, holding each of the set control signals for a predetermined time and outputting each of language broadcasting signals sequentially for each of the held times in the course of the multivoice broadcast; and

returning to the present stored broadcasting state after performing the multivoice broadcast searching step so as to output a language broadcast according to the stored broadcasting state.

Brief Description of the Drawings

FIG. 1 is a block diagram schematically showing a multivoice broadcast search apparatus in a NICAM broadcasting receiver according to the present invention.

Fig. 2 is a flow chart diagram showing one preferred embodiment of a multivoice broadcast search method in a NICAM broadcasting receiver according to the present invention.

FIG. 3 is a flow chart diagram showing a channel selection process when the present channel is changed to another channel in relation to perform a multivoice broadcast search method according to the present invention.

Detailed Description of the Preferred Embodiment

A preferred embodiment of the present invention will be described below in detail with reference to the accompanying drawings.

Referring to Fig. 1, a multivoice broadcast search apparatus in a NICAM broadcasting receiver according to the present invention comprises an antenna ANT, a tuner and demodulator 10, a NICAM decoder and D/A converter 12, first to third switching means 18, 20 and 22, a microcomputer 14, a key matrix circuit 16 and output means 24 and 26.

Referring to Fig. 1, the tuner and demodulator 10 receives radio frequency signals RF through the antenna ANT, selects a channel according to a tuning signal TS supplied from the microcomputer 14, supplies NICAM signals to the NICAM decoder and D/A converter 12, and simultaneously demodulates FM modulated signals so as to supply the FM audio signals FMS to the first switching means 18.

Next, the NICAM decoder and D/A converter 12, which will be referred to "NICAM" briefly, decodes the NICAM signals, that is, the NICAM multivoice stereo broadcasting signals supplied from the tuner and demodulator 10, converts the decoded digital signals into analog signals, and supplies the analog signals to the first switching means 18 through a PCM L-channel PL and a PCM R-channel PR, respectively. Here, the NICAM signals, are PCM (pulse code modulation) digital signals transmitted by means of the QPSK (quadrature phase shift keying) system in the broadcasting station.

On the other hand, the NICAM 12 supplies broadcasting state recognition signals MC2 and CTL dependent upon the broadcasting states of the broadcasting signals inputted thereto to the microcomputer 14. Here, one of the broadcasting state recognition signals denoted by "MC2" represents that the present signals processed in the NICAM 12 is multivoice broadcasting signals when a value of "MC2"equals "1", and the other of the broadcasting state recognition signals denoted by "CTL" is a value of the reverse sound switching flag bit and represents that the FM audio signal FMS outputted from the tuner and demodulator 10 is not equal to any one of the PCM L-channel signal PL and the PCM R-channel signal PR

when a value of "CTL" equals "0"

The first switching means 18 is composed of first input terminals a11 and a12, second input terminals b11 and b12, and first output terminals A and B. The first input terminals a11 and a12 are connected to each of the output terminals L and R of the NICAM 12 respectively, and the second input terminals b11 and
5   b12 both are connected to the output terminals of the tuner and demodulator 10. The first switching means 18 selects the PCM L-channel signal PL and the PCM R-channel signal PR, or the FM audio signal FMS in accordance with the first switching control signal SC1 supplied from the microcomputer 14, and outputs the selected signals through the first output terminals A and B.

The second switching means 20 includes third input terminals a2 and b2 each connected to the first
10   output terminals A and B, respectively and selects one of the input signals at the third input terminals a2 and b2 in accordance with the second switching control signal SC2 supplied from the microcomputer 14 so as to output the selected signal through the second output terminal C. On the other hand, the third switching means 22 includes fourth input terminals a3 and b3 each connected to the first output terminals A and B, respectively and selects one of the input signals at the fourth input terminals a3 and b3 in
15   accordance with the third switching control signal SC3 supplied form the microcomputer 14 so as to output the selected signal through the third output terminal D. The microcomputer 14 supplies the tuning signal TS to the tuner and demodulator 10 and outputs the switching control signals SC1, SC2 and SC3 to control the first to third switching means 18, 20 and 22 in accordance with the broadcasting state recognition signals MC2 and CTL supplied from the NICAM 12 as described hereinbefore. Accordingly, the microcomputer 14
20   performs to search a multivoice broadcast of the received channel. Also, the key matrix circuit 16 is connected to the microcomputer 14. The microcomputer 14 supplies scanning pulses to the key matrix circuit 16. Then, if the user presses the desired selection keys such as channel buttons, and so on installed in the key matrix circuit 16, the selected key information is transmitted to the microcomputer 14. Accordingly, the tuning signal TS is transmitted to the tuner and demodulator 10 and the switching control
25   signals SC1, SC2 and SC3 are transmitted to the respective switching means 18, 20 and 22.

An operation of the multivoice broadcast search apparatus having the composition as described above will be described below with reference to Fig. 1, Fig. 2 and Fig. 3. First, it is assumed that a broadcast received in the multivoice broadcast search apparatus of the present invention is changed into a multivoice broadcast from a mono or stereo music broadcast, the English language is transmitted in the PCM L-
30   channel PL, the German language is transmitted in the PCM R-channel PR and the French language is transmitted in the normal FM audio channel.

Now, when the multivoice broadcast as assumed above is received in the multivoice broadcast search apparatus as shown in Fig. 1, the tuner and demodulator 10 demodulates the FM modulated signal. Accordingly, the French language broadcast is supplied to the second input terminals b11 and b12 of the
35   first switching means 18, and simultaneously the NICAM signals are supplied to the NICAM 12. The NICAM 12 decodes the NICAM signals, outputs the broadcasting state recognition signals MC2 and CTL to the microcomputer 14, converts the decoded digital signals into analog signals through the D/A converter, and supplies the English language broadcast in the PCM L-channel PL and the German language broadcast in the PCM R-channel PR to the first input terminals a11 and a12 of the first switching means 18.
40   Here, the values of the broadcasting state recognition signals MC2 and CTL equal "1" and "0", respectively since the present received broadcast is a multivoice broadcast, and the language in the FM audio channel is not equal to any one of the languages in the PCM L-channel and the PCM R-channel.

FIG. 2 is a flow chart diagram showing one preferred embodiment of a multivoice broadcast search method in a NICAM broadcasting receiver according to the present invention.
45   Referring to FIG. 2, the microcomputer 14 determines that the value of the broadcasting state recognition signal MC2 equals "1" at step 30 and the value of the past MC2 equals "0" at step 34, when the present broadcast is changed into the multivoice broadcast from the mono or stereo music broadcast. In this case, the value of the past MC2 equals "0" because the previous broadcast was the mono or stereo music broadcast. Then, the value of the past MC2 is set to "1" at step 36, and the control logic values of
50   the first to third switching means 18, 20 and 22 at step 38 are stored in the microcomputer 14. That is, the logic values of the first to third stitching control signals SC1, SC2 and SC3 are stored in the microcomputer 14. Next, at step 40, the microcomputer 14 supplies the scanning pulses to the key matrix circuit 16 and determines if the user's selection key inputs from the key matrix circuit 16 enter the microcomputer 14. Accordingly, if the user selects any control keys in the key matrix circuit 16, a general operation of the
55   NICAM receiver to which the multivoice broadcast search method according to the present invention is applied is performed at step 70 in accordance with the user's selection key inputs. That is, the first to third switching means 18, 20 and 22 are switched over in accordance with the user's selection key inputs through the key matrix circuit 16. On the other hand, if the microcomputer 14 determines that there are no

4

user's selection key inputs from the key matrix circuit 16 at step 40, the microcomputer 14 sets the values of the first to third switching control signals SC1, SC2 and SC3 to "1", "1" and "0", respectively, and holds them for "X"seconds at step 42. That is, the first input terminals a11 and a12 in the first switching means 18 are connected to the first output terminals A and B, respectively for "X" seconds. At the same time, the second and the third output terminal C and D in the second and the third switching means 20 and 22 are connected to one a2 of the third input terminals a2 and b2 and one b3 of the fourth input terminals b3, respectively for "X" seconds. Accordingly, the English language broadcast in the PCM L-channel PL is outputted through the output means 24 and 26. On the other hand, the microcomputer 14 decreases the time of "X" seconds set at step 42 by a predefermined time at step 44, and checks the time remaining equals "0" at step 46. That is, the microcomputer 14 checks the English language broadcast is outputted for "X" seconds at step 46. Thus, at step 44, the microcomputer 14 performs to decrease the set time until the time remaining equals "0" at step 46. If the time remaining equals "0" at step 46, the microcomputer14 determines that the user's selection key information are inputted through the key matrix circuit 16 at step 48. When the user's selection key information are inputted at step 48, the microcomputer 14 goes to step 70 and then instructs the receiver to which the present invention is applied to perform a general operation in accordance with the user's selection key information supplied from the key matrix circuit 16. That is, the first to third switching means 18,20 and 22 are switched over in accordance with the user's selection key information at step 70, and then the user's desired language broadcast among the English, German and French languages is outputted through the output means 24 and 26.

On the other hand, when the user's selection key information are not inputted at step 48, the microcomputer 14 sets the values of the first to third switching control signals SC1, SC2 and SC3 respectively for switching the first to third switching means 18, 20 and 22 to "1", "0" and "1" respectively, and holds them for "X" seconds at step 50.

Accordingly, the first output terminals A and B are connected to the first input terminals a11 and a12, respectively in the first switching means, 18. The second output terminal C is connected to one b2 of the third input terminals a2 and b2 in the second switching means 20, and the third output terminal D is connected to one a3 of the fourth input terminals a3 and b3 for "X" seconds. Thus, the German language broadcast in the PCM R-channel PR is outputted through the output means 24 and 26. Now, the first to third switching control signals SC1, SC2 and SC3 set to the predetermined values and held for "X" seconds are processed in steps 52 and 54 performing a function similar to that of the above-mentioned steps 44 and 46, with the result that the German language broadcast is outputted and held for "X" seconds.

Next, the microcomputer 14 performs the same process as that of the above-mentioned step 40 or 48 at step 56 and proceeds to step 58. At step 58, the microcomputer 14 checks if the broadcasting state recognition signal CTL equals,"1". In the present embodiment, the multivoice broadcast is received in the NICAM receiver for receiving the English, German and French languages which are transmitted in a single channel from the broadcasting station at the same time. Accordingly, the broadcasting state recognition signal is "0" as described above.

This the microcomputer 14 checks that the value of "CTL" is not "1", and proceeds to step 60. At step 60, the microcomputer 14 sets the values of the first to third switching control signals SC1, SC2 and SC3 to "0","0" and "1", respectively, and holds them for "X" seconds. At this time, the first output terminals A and B are connected to the second input terminals b11 and b12, so as to select the French language broadcast in the FM audio channel supplied from the tuner and demodulator 10 to the first switching means 18. The second output terminal C in the second output terminal C in the second switching means 20 is connected to one b2 of the third input terminals a2 and b2, and the third output terminal D in the third switching means 22 is connected to one a3 of the fourth input terminals a3 and b3. Then, the microcomputer 14 proceeds to steps 62 and 64, and performs the same processes as those of the above-mentioned steps 44 and 46. Accordingly, the French language broadcast is outputted for "X" seconds through the output means 24 and 26. If the time remaining is "0" at step 64, that is, the French language broadcast is outputted and held for "X" seconds, the microcomputer 14 checks if the user's selection key information selected in the key matrix circuit 16 are inputted or not at step 66. When it is determined that the user's selection key information are inputted at step 66, the microcomputer 14 proceeds to step 70 as described above and performs a general operation of the NICAM 70 receiver. If the user's selection key information are not inputted to the microcomputer 14 at step 66, the microcomputer 14 instructs the first to third switching means 18, 20 and 22 to be operated by the first to third switching control signals SC1, SC2 and SC3 stored at step 38, and finishes to perform the multivoice broadcast search operation. On the other hand, if it is determined that the value of "CTL" equals "1" at step 58, at least one of the signals in the PCM L-channel PL and the PCM R-channel PR supplied from the NICAM 12 is equal to the signal in the FM audio channel supplied from the tuner and demodulator 10, thereby the multivoice broadcast search operation is finished.

5

Also, because the present invention is for confirming what languages are broadcast in the course of receiving the multivoice broadcast, the microcomputer 14 sets the value of the past MC2 to "0" at step 32 and finishes to perform the multivoice broadcast search operation when the state of the present broadcast is not a multivoice broadcast, that is, the value of "MC2" is not "1" at step 30 of Fig. 2. Also, when the value of the past MC2 is not "0" at step 34, the multivoice broadcast search operation is finished.

Therefore, the outputs through the output means 24 and 26 are shown in Table as a result of performing the multivoice broadcast search method when the present broadcast is changed from a stereo music broadcast into a multivoice broadcast.

Table

output	Output signal for a predetermined time [sec]				
means	0	X secs	X secs	X secs	END
24	stereo L-channel signal	English	German	French	Original Output signal
26	stereo R-channel signal	English	German	French	Original Output signal

Up to now, the present invention has been described limiting to the case that the present received broadcast is changed from the stereo music broadcast into the multivoice broadcast in the same channel. However, when the user selects another channel, with the result that the broadcast in the selected channel is a multivoice broadcast, the microcomputer 14 performs the channel selection in accordance with a flow chart of Fig. 3 showing a channel selection process in the course of changing the channel.

Referring to FIG. 3, a channel alteration is performed in such a manner that a tuning signal corresponding to the selected channel at step 72 is supplied to the tuner and demodulator 10 at step 74, and the value of the past MC2 is set to "0" at step 76. When the broadcast in the selected channel is a multivoice broadcast, the microcomputer 14 performs a multivoice broadcast search method in accordance with the flow chart of FIG. 2.

Also, when the user powers up the system initially, and the broadcast in the set initial channel is a multivoice broadcast, a multivoice broadcast search method according to the present invention is performed according to the flow chart of FIG. 2.

Also, when a multivoice broadcast is received in the receiver to which the present invention is applied, and then the multivoice broadcast is changed into a mono or stereo music broadcast, and again the mono or stereo music broadcast is changed into the multivoice broadcast, a multivoice broadcast search method is performed in accordance with the flow chart FIG. 2 because the value of the broadcasting state recognition signal MC2 is "1", and the value of the past MC2 is "0".

The multivoice broadcast search method and the apparatus thereof according to the present invention have been described in terms of one preferred embodiment of a NICAM broadcasting receiver, however the present invention is not necessarily limited thereto. For example, it is understood that various changes and modifications in such a manner that the NICAM decoder in the NICAM decoder and D/A converter block of the present invention is modified to decode the other broadcasting signals can be made.

As described above, the present invention outputs the respective language broadcasts in the multivoice broadcast automatically for a predetermined time for the viewer when the received broadcast is a multivoice broadcast. Accordingly, the present invention enables the viewer to select his desired language broadcast with ease without confirming what languages are broadcast by changing-over the broadcasting signal to that of a FM audio channel, a PCM L-channel or a PCM R-channel each time.

Claims

1. A multivoice broadcast search method in a NICAM

broadcasting receiver, comprising the steps of : determining whether the present broadcast is a multivoice broadcast or not, so as to store the present broadcasting state when the present broadcast is the multivoice broadcast, and to end an operation when the present broadcast is not the multivoice broadcast ;

searching each of language broadcasts of the multivoice broadcast by setting values of predetermined control signals to predetermined values, holding each of the set control signals for a predetermined time and outputting each of language broadcasting signals sequentially for each of the held times in the course of the multivoice broadcast ; and

returning to the present stored broadcasting state after performing the multivoice broadcast searching step so as to output a language broadcast according to the stored broadcasting state.

2. The multivoice broadcast search method as claimed in claim 1, wherein said multivoice broadcast searching process comprises the steps of :

searching a first language by setting the values of the predetermined control signals to the predetermined values, holding the values of the predetermined control signals for a predetermined time, and then confirming that the user's selection key information are inputted to a microcomputer through a key matrix circuit, with the result that if the user's selection key information are inputted to the microcomputer, a general operation of the receiver is performed, and if not, a subsequent process is performed;

searching a second language where the same process as that of said first language searching step is performed, but the values of the predetermined control signals set in the microcomputer are different;

checking a number of the broadcasting languages in the multivoice broadcast by confirming the broadcasting state recognition signal, with the result that if the number of the broadcasting languages is equal to or more than "3", a subsequent process is performed, and if the number of the broadcasting languages is less than "3", the original broadcasting signals are outputted; and

searching a third language where the same process as that of said first language searching step is performed, but the values of the predefermined control signals set in the microcomputer are different, when the number of the languages is equal to or more than "3" in checking said numbers of the broadcasting languages.

3. The multivoice broadcast search method as claimed in claim 1, further comprising the steps of :

supplying a tuning signal to a tuner and demodulator in accordance with the user's selected channel information received by the microcomputer; and

setting a logic value of the past multivoice broadcast recognition signal among the broadcasting state recognition signals supplied to the microcomputer to "0", so as to recognize that the past broadcasting signal before changing the channel is not a multivoice broadcast, whereby it is capable of being applied when a broadcasting state of the user's selected channel in the course of receiving and ony of the various broadcasting channels is a multivoice broadcast.

4. A multivoice broadcast search apparatus in a NICAM broadcasting receiver comprising: a tuner and demodulator connected to an antenna and for selecting a viewer's desired frequency signal among radio frequency signals received from the antenna in accordance with a tuning signal inputted at a tuning signal input terminal, outputting NICAM broadcasting signals and simultaneously demodulating FM modulated signals so as to output FM audio signals ;

a NICAM decoder and D/A converter connected to one output terminal of the tuner and demodulator and for decoding the NICAM broadcasting signals outputted from the tuner and demodulator, converting the decoded digital signals into analog signals, outputting PCM L-channel signals and PCM R-channel signals and simultaneously outputting broadcasting statej recognition signals ;

first switching means having first input terminals at which the PCM L-channel signals outputted from the NICAM decoder and D/A converter are inputted, second input terminals at which the FM audio signals outputted from the tuner and demodulator are inputted and first output terminals changed and connected to the first or the second input terminals according to a first switching control signal and for selecting the PCM L-channel signals and the PCM R-channel signals, or the FM audio signals ;

second switching means having a third input terminals each connected to the first output terminals of the first switching means, and a second output terminal changed and connected to one of the third input terminals according to a second switching control signal and for selecting a single output;

third switching means having fourth input terminals each connected to the first output terminals of

7

the first switching means, and a third output terminal changed and connected to one of the fourth input terminals according to a third switching control signal and for selecting a single output;

a microcomputer for supplying the first to third switching control signals to the first to third switching means according to the broadcasting state recognition signals supplied from the NICAM decoder and D/A converter, and outputting the tuning signal and the first to third switching control signals according to the viewer's selected signal at a key matrix circuit coupled to the micro computer; and

output means connected to the second output terminal and the third output terminal respectively, and for outputting an audio L-channel signal and an audio R-channel signal respectively.
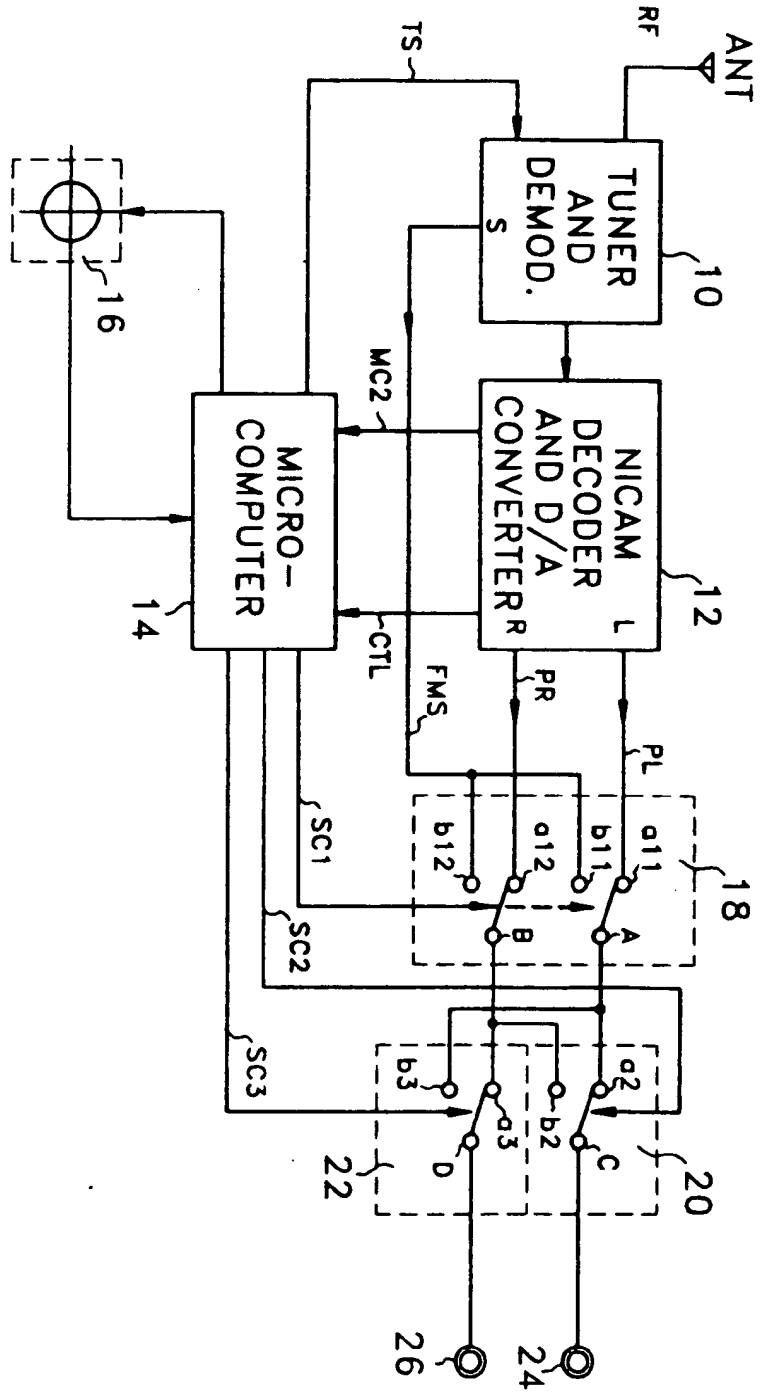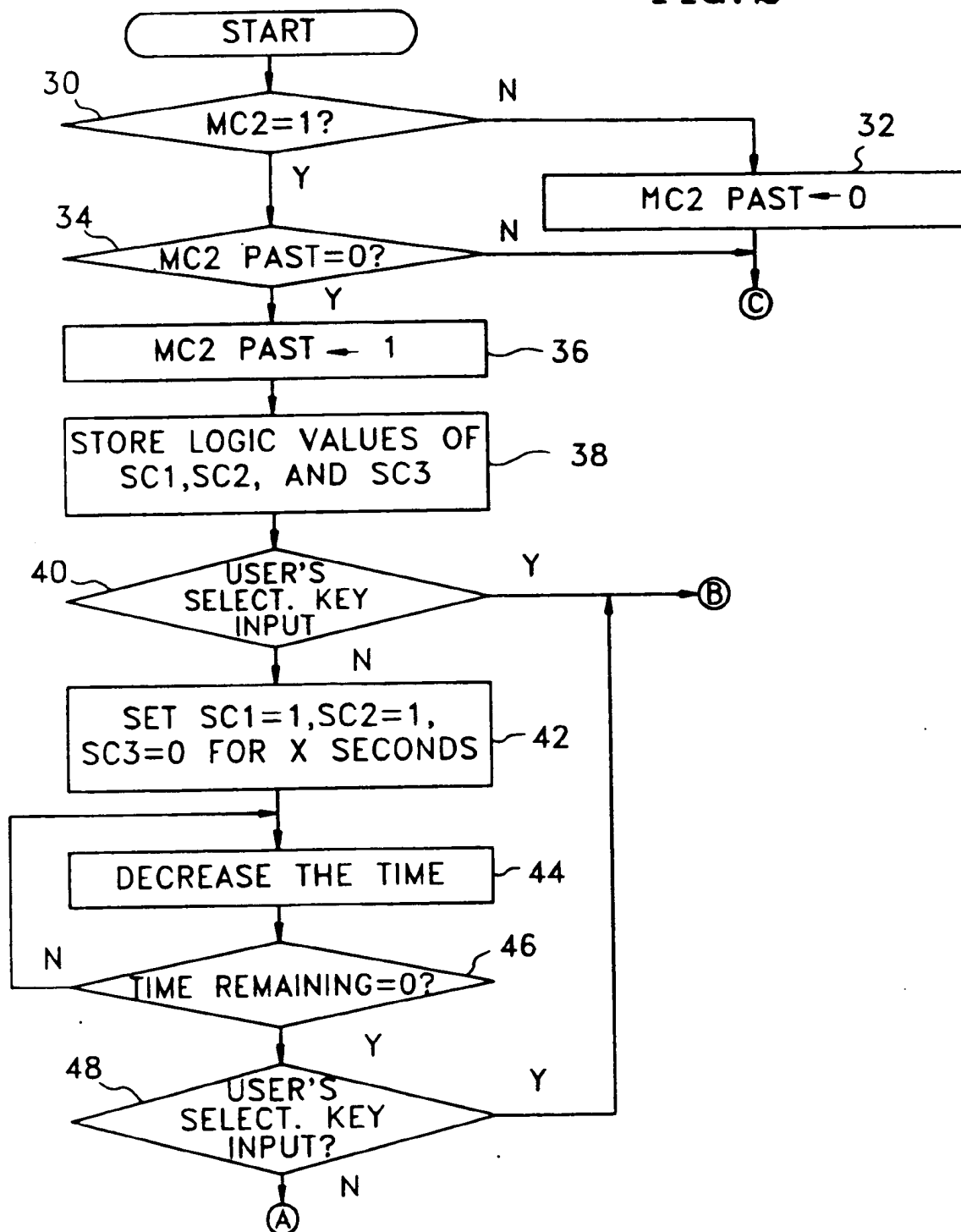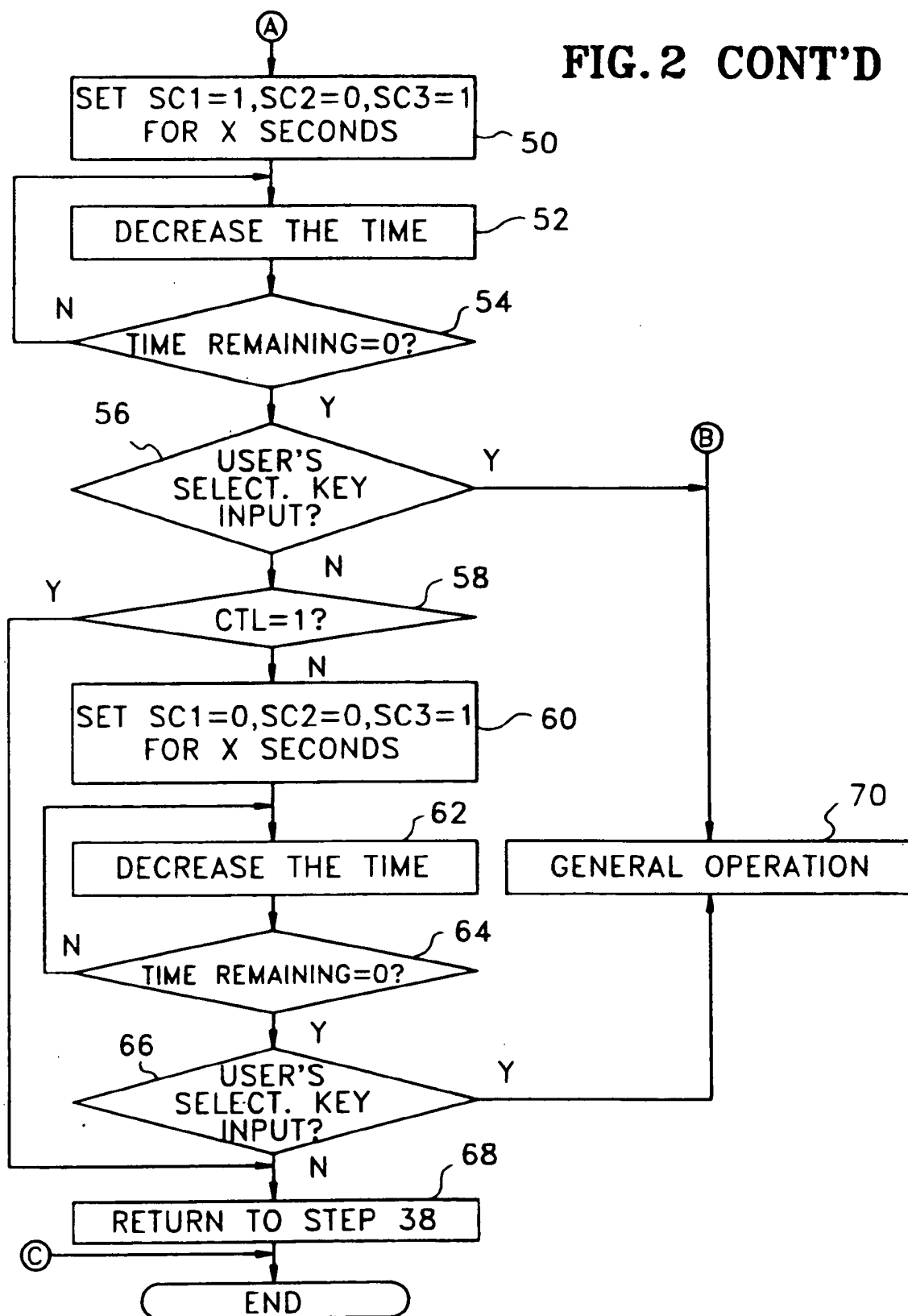
FIG. 1

FIG. 2

FIG.2 CONT'D

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SET SC1=1,SC2=0,SC3=1 FOR X SECONDS — 50

DECREASE THE TIME — 52

54 — TIME REMAINING=0? N

56 — USER'S SELECT. KEY INPUT? Y → Ⓑ

N

58 — CTL=1? Y

N

SET SC1=0,SC2=0,SC3=1 FOR X SECONDS — 60

DECREASE THE TIME — 62

GENERAL OPERATION — 70

64 — TIME REMAINING=0? N

66 — USER'S SELECT. KEY INPUT? Y

N

RETURN TO STEP 38 — 68

Ⓒ

END

FIG.3

START

CHANNEL SELECTION $\sim$ 72

TUNING SIGNAL OUTPUT $\sim$ 74

MC2 PAST $\leftarrow$ 0 $\sim$ 76

END